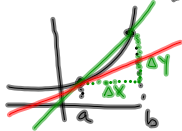


Review 6 Average Rate of Change Instantaneous Rate of Change

ave rate = $\frac{f(b)-f(a)}{b-a}$ or $\frac{y_2-y_1}{x_2-x_1} = \frac{\Delta y}{\Delta x}$
slope of secant



$$\Delta x = h = b - a$$

$$a+h=b$$

inst rate = $f'(a) = \lim_{h \rightarrow 0} \frac{f(a+h)-f(a)}{h}$
slope of tangent

Ex 1.

time (min)	0	4	8	12	16
Temp (°C)	65	68	73	80	90

- a) Estimate the instantaneous rate at which the Temp of the oven is increasing at $t=10$
b) explain the meaning of this number

a) $\frac{80-73}{12-8} = \frac{7}{4} \frac{^\circ\text{C}}{\text{min}}$

b) at $t=10$ the temp is increasing by $\frac{7}{4}^\circ\text{C}$ per min.

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Ex 2

which of the following best approximates

$$\frac{\ln(x+h) - \ln(x)}{h} \quad \text{for small values of } h$$

- a) $\ln x$
b) $\ln(x) - \ln(h)$
c) $\ln\left(\frac{x+h}{h}\right)$
d) $\frac{1}{x}$
e) $\frac{1}{x} - \frac{1}{h}$

Ex 3

At a certain instant, the rate of increase of the area of a circle is equal to twice the rate of increase of the circumference.

What is the radius at that instant?

$$C = 2\pi r \quad A = \pi r^2$$

$$\frac{dC}{dt} = 2\pi \frac{dr}{dt} \quad \frac{dA}{dt} = 2\pi r \frac{dr}{dt}$$

$$\frac{dA}{dt} = 2 \frac{dC}{dt}$$

$$2\pi r \frac{dr}{dt} = 2 \cdot 2\pi \frac{dr}{dt}$$

$$r = 2$$

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